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Bristol-Myers Squibb Manuf cturing Company

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Phase 2C Release Assessment
Potential Preferential Pathway Evaluation
Sampling and Analysis Plan

Bristol-Myers Squibb Manufacturing Company
Humacao, Puerto Rico

January 17, 2017

Reviewed by
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Site Visit
April 27, 2017
May 9, 2017
May 11, 2017

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Acronyms

APHIS	Animal and Plant Health Inspection Service
bgs	Below Ground Surface
BMSMC	Bristol-Myers Squibb Manufacturing Company
COPC	Compound of Potential Concern
eV	Electron Volt
GPR	Ground Penetrating Radar
ID	Inner Diameter
IDW	Investigation Derived Waste
msl	Mean Sea Level
OD	Outer Diameter
OVA	Organic Vapor Analyzer
PE	Professional Engineer
PID	Photoionization Detector
PPE	Personal Protective Equipment
PRASA	Puerto Rico Aqueduct and Sewer Authority.
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PRDOT	Puerto Rico Department of Transportation
PRWQS	Puerto Rico Water Quality Standard
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFE	Radiofrequency Electromagnetics
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SIM	Selective Ion Monitoring
SMP	Soil Management Plan
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USEPA	Unites States Environmental Protection Agency
WWTP	Wastewater Treatment Plant

1.0 Introduction

This document presents the *Phase 2C Release Assessment Potential Preferential Pathway Evaluation Sampling and Analysis Plan* (SAP) for the Bristol-Myers Squibb Manufacturing Company (BMSMC) pharmaceutical facility located in Humacao, Puerto Rico. The BMSMC facility is located at the Humacao Industrial Park, State Road No. 3, in Humacao, Puerto Rico (**Figure 1**). A complete copy of the Phase *2C Release Assessment Potential Preferential Pathway Evaluation Sampling and Analysis Plan* is provided on CD on the back cover of this document.

Results of the 2016 Release Assessment Phase 1 Field Program indicated that certain compounds of potential concern (COPCs) were detected in groundwater above May 2016 Unites States Environmental Protection Agency (USEPA) regional screening levels (RSLs) for tapwater and/or residential groundwater concentrations for vapor intrusion along the downgradient southern perimeter of the BMSMC facility. Specifically, 1,4-Dioxane was detected above its tapwater RSL and its residential groundwater screening level for vapor intrusion along the downgradient southern perimeter of the facility and Benzene, MTBE, tert-Amyl Alcohol, Naphthalene, and C11-C22 Aromatics were detected above their tapwater RSLs in at least one groundwater sample collected along the downgradient southern perimeter of the facility.[1] In addition, Dieldrin and Benzaldehyde were detected in soil samples collected along the southern perimeter of the facility at concentrations above their respective protection of groundwater RSL. Results of the Release Assessment Phase 1 Field Program were submitted to the USEPA in the September 2016 *Release Assessment Phase 1 Technical Memorandum* (AMAI, 2016a).

Results of the 2016 Release Assessment Phase 2A Field Program indicated that 1,4-Dioxane, Chloroform, Dichlorodifluoromethane, and Vinyl Chloride were detected in groundwater samples collected immediately downgradient of the southern perimeter of the facility along State Road No. 3 at concentrations that exceeded either USEPA groundwater screening levels or Puerto Rico Water Quality Standards (PRWQS). Results of the Release Assessment Phase 2A Field Program were submitted to the USEPA in the October 2016 *Release Assessment Phase 2A Technical Memorandum: Offsite Groundwater – South of Facility* (AMAI, 2016c).

[1] Results of the September 2016 groundwater sampling event indicate that 1,4-Dioxane, Benzene, C9-C10 Aromatics, and C11-C22 Aromatics were detected at concentration levels that exceeded their May 2016 USEPA groundwater action levels. MTBE, tert-Amyl Alcohol, and Naphthalene were not detected at concentration levels that exceeded their May 2016 USEPA groundwater screening levels during the September 2016 sampling event.

Based on the results of the Phase 1 and Phase 2A Field Programs, as well as subsequent quarterly onsite groundwater sampling conducted in September 2016, BMSMC submitted a proposed groundwater sampling plan for the offsite monitoring wells installed during the Phase 2A Field Program (AMAI, 2016d). Specifically, the *Technical Memorandum: Proposed Sampling Program Offsite Groundwater – South of Facility* provided the basis for future sampling of the offsite monitoring well network for the following parameters:[2]

Benzene	Methyl-Tert Butyl Ether
tert-Amyl Alcohol	1,2-Dichloroethane
Chloroform	Dichlorodifluoromethane
Vinyl Chloride	1,4-Dioxane
Naphthalene	Benzo(a)anthracene
Benzaldehyde	C9-C10 Aromatics
C11-C22 Aromatics	Dieldrin

The proposed offsite groundwater sampling plan indicated that offsite groundwater monitoring will continue on a quarterly basis until such time that USEPA approves a BMSMC petition for a reduction in either the monitoring schedule and/or parameter list.

As noted in the Phase 2A Technical Memorandum, groundwater flow patterns in the vicinity of State Road No. 3 appear to deviate from the general groundwater flow direction (southeast) with an eastern groundwater flow component. Based on the results of the Release Assessment Phase 1 and Phase 2A Field Programs, it was postulated that utility bedding in/around State Route No. 3 may act as a potential preferential pathway for localized groundwater flow. As such, the Phase 2A Technical Memorandum recommended the completion of additional field investigation activities along State Road No. 3 to evaluate the interaction between groundwater flow, subsurface utilities, and associated utility bedding material to confirm the validity of this assumption.

Based on a review of subsurface utilities in the vicinity of the BMSCS facility, it appears likely that the eastern groundwater flow component observed along State Road No. 3 may be related to the presence of subsurface utilities located beneath State Road No. 3. A plan view and vertical profile of the major subsurface utilizes (sanitary and storm sewers) identified along State Road No. 3 in the vicinity of the BMSCS facility are illustrated on **Figure 2**. Groundwater elevations

[2] The parameter list for the offsite monitoring wells may be expanded based on the results of future quarterly sampling of the onsite monitoring wells located along the southern downgradient perimeter of the Facility.

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and potentiometric groundwater contours measured in October 2016 are also illustrated on **Figure 2**.

Two of the sewers depicted on **Figure 2**, specifically the 52"x72" elliptic storm sewer and the 36" sanitary sewer, are constructed with invert elevations that may influence groundwater flow patterns or be subject to groundwater infiltration. As noted in the Phase 2A Technical Memorandum, saturated soil in soil borings completed along State Road No. 3 was typically encountered at an elevation of approximately 6.5 feet above mean sea level (msl).

The 52"x72" elliptic storm sewer flows from west to east, ultimately discharging to Frontera Creek southeast of the BMSMC Facility (see **Figure 2**). South of the BMSMC facility, the invert elevation of the 52"x72" elliptic storm sewer is estimated to be between 6.5 and 7 feet above msl or approximately 10 feet below ground surface (bgs). The 36" sanitary sewer flows from east to west from the entrance to the Ciudad Cristiana neighborhood for approximately 770 feet and then south to the Humacao regional wastewater treatment plant (WWTP) (see **Figure 2**). South of the BMSMC Facility, the invert elevation of the 36" sanitary sewer ranges from 5.8 to 6.1 feet above msl.

The objectives of the Potential Preferential Pathway Evaluation SAP are as follows:

- Determine if the bedding material of the 52"x72" elliptic storm sewer and/or the 36" sanitary storm sewers are acting as potential preferential pathways for contaminant transport.
- Delineate the extent of 1,4-Dioxane impacts in groundwater adjacent to subsurface utilities located along State Road No. 3.
- Determine if semi-confined groundwater conditions are present along State Road No. 3.
- Evaluate potential for infiltration of impacted groundwater into the 52"x72" elliptic storm sewer.

QAPP 2016

The overall investigation will be implemented in accordance with the provisions of the amended June 2016 Release Assessment Phase 2A SAP Quality Assurance Project Plan (QAPP) (AMAI, 2016b; BMSMC, 2016). Specific field sampling and analytical procedures that will be implemented during the completion of the Potential Preferential Pathway Evaluation are presented below.

2.0 Sampling and Analysis Plan

This section presents the specific field sampling and analytical procedures that will be implemented during the completion of the Potential Preferential Pathway Evaluation.

The overall scope of work has been developed to evaluate the interaction between groundwater flow, subsurface utilities, and associated utility bedding material to assess the potential presence of a preferential groundwater contaminant transport pathway along State Road No. 3 and any principal lateral sewer lines. Tasks that will be completed for the Potential Preferential Pathway Evaluation SAP include:

- Pre-Sampling Activities;
- Sewer Test Pit Excavations;
- Monitoring Well/Piezometer installation;
- Groundwater Sampling;
- Storm Sewer Infiltration Assessment;
- Sample Location Survey; and
- Management of Investigation Derived Waste.

Specific activities that will be completed for each task list are provided below.

2.1. Pre-Sampling Activities

Site preparation activities will be completed prior to subsurface sampling and will include the following activities:

- Notify the Puerto Rico Aqueduct and Sewer Authority (PRASA) of test pit excavations adjacent to their sanitary sewer;
- Obtain approval from the Puerto Rico Department of Transportation (PRDOT) Public Safety Commission to construct monitoring wells/temporary sampling points and associated sampling activities on utility rights of way;
- Receive approved authorization to construct monitoring wells from the Puerto Rico Department of Natural and Environmental Resources (PRDNER);
- Receive approved authorization from the Municipality of Humacao Planning Department to construct monitoring wells on municipal streets south of the Facility;

- Field-locate proposed test pit excavations, monitoring well locations, and piezometer location;
- Request utility clearance by the PRDOT Public Safety Commission; and
- Complete ground penetrating radar (GPR) and radiofrequency electromagnetics (RFE) survey of the proposed sample locations to identify the presence or absence of subsurface utilities. The GPR/RFE survey will be completed by GeoEnviroTech of Guaynabo, PR.

2.2. Sewer Test Pit Excavations

Three test pit excavations will be completed to determine if the bedding material of the sanitary and/or storm sewers is acting as a potential preferential pathway for contaminant transport. Two test pit excavations will be completed adjacent to the 52"x72" elliptic storm sewer (SEWTP-1 and SEWTP-2) and one test pit excavation will be completed adjacent to the 36" sanitary sewer (SEWTP-3). The proposed sewer test pit excavations are illustrated on **Figure 3** (please note that the final locations of these test pits may change and are subject to field verification). The location rationale for each sewer test pit excavation is provided below.

Excavation	Rationale
SEWTP-1	Located adjacent to the 52"x72" elliptic storm sewer and downgradient of Phase 1 in-situ groundwater sample location RA-14S/D where elevated levels of 1,4-Dioxane were detected in groundwater.
SEWTP-2	Located at the entrance of Ciudad Cristiana neighborhood between the 52"x72" elliptic storm sewer and 36" sanitary sewer near the discharge point of the storm sewer into Frontera Creek. This location will also be used to evaluate the potential for preferential groundwater transport pathways along lateral sewers which may enter the Ciudad Cristiana residential community.
SEWTP-3	On the unnamed road west of Bard Pharmaceuticals Limited. Located adjacent to the 36" sanitary sewer and downgradient of Phase 1 monitoring well S43S/D where elevated levels of 1,4-Dioxane were detected in groundwater.

Check the Range in concentration level

2.2.1. Sewer Test Pit Excavation Procedures

All test pit excavation work will be conducted in accordance with 29 CFR Part 1926 Subpart P. The following sequence of work will be completed at each sewer test pit excavation:

1. Establish appropriate traffic control safeguards according to the approved Traffic Control Plan required by the Municipality of Humacao and PRDOT.

2. Saw cut an approximate 8 foot wide by 10 foot long area of pavement centered over the assumed top of the storm sewer and remove the pavement with an excavator.

3. Complete a pilot trench across the excavation perpendicular to the alignment of the storm sewer to hand clear the top two feet of the excavation area. This depth is estimated to be approximately two feet above the anticipated top of the storm sewer.

4. If the top of the storm sewer is determined to be at a depth greater than two feet below the surface, then the top two feet of material within the excavation area will be carefully removed with an excavator.

5. Hand excavate soil below the upper two feet within the excavation to expose the top and sides of the storm sewer.

6. With an excavator, remove soil adjacent to the exposed storm sewer to facilitate the installation of a trench box.

7. Install a professional engineer (PE)-certified high clearance trench box in the open excavation. The width of the trench box will be designed to allow approximately two feet of clearance on each side of the storm sewer.

8. With a mini backhoe/excavator or manual excavation, continue to remove soil from within the trench box to expose the sides of the storm sewer until sewer bedding material or groundwater is encountered. It is anticipated the base of the storm sewer is approximately 10 feet bgs.

9. Install a temporary slotted polyvinyl chloride (PVC) pipe or manually driven Geoprobe® screen point sampler that is screened across the storm sewer bedding.[3]

[3] It is anticipated that saturated soil conditions will be encountered near the base of the storm sewer. If the top of the saturated zone appears to be below the bedding material of the storm sewer, then a groundwater sample will not be collected.

10. Collect groundwater samples using a mini-bailer or mechanical bladder pump in accordance with SOP GW-9 *Direct Push Groundwater Sampling.*[4]

11. Backfill excavation to a height equal to the road surface and secure road plate(s) over the excavation area.

12. Restore asphalt pavement to PRDOT specifications.

It is anticipated that each test pit excavation will take approximately two days to complete. Steel road plates will be placed and secured over excavation areas that remain open overnight. Traffic control measures, including lane closure, will be maintained overnight whenever an excavation remains open and road plates have been installed.

Groundwater samples will be analyzed for 1,4 Dioxane according to SW-846 Method 8270D using selective ion monitoring (SIM). Groundwater analysis will be performed by SGS Accutest Laboratories of Dayton, NJ. QA/QC samples, including duplicates, equipment blanks, field blanks, matrix spike, matrix spike duplicates, and trip blanks will be collected in accordance with the amended QAPP (AMAI, 2016b; BMSMC, 2016). Groundwater samples will be analyzed with an expedited turnaround time of 24 hours. Contingency sample(s) will be analyzed if the primary sample indicates anomalous results or as necessary (e.g. primary sample damaged during transport).

2.2.2. Soil Management

An onsite roll-off container will be mobilized to the former Biopile Area for the temporary storage and management of demolition debris such as broken asphalt and road bed material. Demolition debris from the test pit excavations will be transported to the onsite roll-off container in dump trucks. Waste characterization composite samples will be collected from the roll-off container and analyzed for the parameters required by the disposal facility.

It is anticipated that the underlying soil will be re-used as backfill material and will be temporarily staged adjacent to the excavation area with appropriate sedimentation control measures such as plastic sheeting and hay bales. Excess soil from the excavation that is not used as backfill will be managed according to the procedures described in Section 2.7.

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[4] Two additional groundwater sample sets will be collected as a contingency to ensure additional sample volume is available, if needed.

2.2.3. Pavement Restoration

Final pavement restoration will occur after the completion of the three test pit excavations. Pavement restoration will be completed in accordance with PRDOT requirements (DOTPW, 2005). As noted above, temporary pavement restoration will include backfilling the excavation to the road surface and placement of secured road plate(s) over the excavation area. Traffic control measures as required by the PRDOT will remain in place until final pavement restoration is complete.

2.3. Monitoring Well/Piezometer Installation

2.3.1. Monitoring Well Installation

Shallow and deep paired monitoring wells will be installed at four locations (OSMW-7S/D – OSMW-10S/D) to further delineate the extent of 1,4-Dioxane impacts along State Road No. 3. A fifth monitoring well pair (OSMW-11S/D) will be installed near the entrance to the Ciudad Cristiana residential community. The proposed monitoring well locations are shown on **Figure 3.**[5] The rationale for monitoring well locations is presented below.

Monitoring Well Pair	Rationale
OSMW-7S/D	Upgradient monitoring well on State Road No. 3 near Phase 2A sample location OSGP-1 where low levels of 1,4-Dioxane were detected in in-situ groundwater samples.
OSMW-8S/D	Along State Road No. 3 near Phase 2A sample location OSGP-2 and downgradient of Phase 1 monitoring wells S-43S/D where elevated levels of 1,4-Dioxane were detected in groundwater.
OSMW-9S/D	Along State Road No. 3 between the residential area and Phase 2A monitoring well pair OSMW-1S/D where elevated levels of 1,4-Dioxane were detected in the groundwater. Due to prevalence of underground utilities in this area, this location represents the closest feasible location to monitor groundwater conditions upgradient of the discharge points of the elliptic and BMSMC storm sewers into Frontera Creek.

[5] Monitoring well locations may be modified based on the results of the sewer test pit excavations and/or field verification results.

Monitoring Well Pair	Rationale
OSMW-10S/D	Along State Road No. 3 and downgradient of the discharge points of the elliptic and BMSMC storm sewers into Frontera Creek.
OSMW-11S/D	Near the entrance to the residential area and Phase 2A sample location OSGP-3 where the highest 1,4-Dioxane concentrations were detected in the residential area. Also located near the storm/sanitary sewer near the entrance to residential area.
OSMW-12S/D	On the unnamed road west of Bard Pharmaceuticals Limited. Located adjacent to the 36” sanitary sewer to confirm whether or not the bedding of the sanitary sewer acts as a potential preferential pathway for contaminant transport in groundwater.

Direct push drilling methods will be used to facilitate soil logging and the installation of monitoring wells. GeoEnviroTech of Guaynabo, PR will provide direct push drill services for the Potential Preferential Pathway Evaluation. Continuous soil samples will be collected from the surface to approximately two feet below the first confining layer. Based on the results of the Phase 2A field program, the first confining layer below the saturated zone is expected to be encountered at 18 feet bgs. Soil samples will be collected in disposable 4-foot macro-core plastic liners and will be inspected and logged by the field geologist to document sample recovery and physical attributes of the sample including grain size, density, plasticity, and moisture content. Soil samples will also be screened for the presence of contaminant impacts using and organic vapor analyzer (OVA) equipped with a 10.6 electron volt (eV) photoionization detector (PID).

Shallow and deep monitoring wells will be installed according to SOP GW-1 *Groundwater Monitoring Well Installation Using Hollow Stem Auger*. 4.25 inch inside diameter (ID) by 7.25 inch outside diameter (OD) hollow-stem augers will be used to facilitate the installation of 2-inch diameter monitoring wells. At each location, the shallow monitoring well will be screened across the top of the upper saturated zone and the deep monitoring well will be screened across the base of upper saturated zone.[6]

Depth 100 ft bgs MW

Shallow and deep monitoring wells will be constructed with 2-inch diameter PVC screen and riser. Each monitoring well will be constructed with a five-foot long 20 slot well screen. The

[6] The screened interval of the shallow monitoring well will also include the elevation of the base of the 52”x72” elliptic storm sewer (see **Figure 2**).

annular space between the borehole and well screen and riser will be filled with an appropriately-sized sand pack, bentonite seal, and cement/grout to the surface. Monitoring wells will be developed a minimum of 24 hours after completion using pump and surge methods according to SOP GW-10 *Monitoring Well Development.*

2.3.2. Piezometer Installation

One shallow piezometer (OSPZ-1) will be installed in the unsaturated zone in the vicinity of new monitoring well pair OSMW-8S/D to confirm if water levels measured in monitoring wells represent potentiometric surface elevations rather than water table elevations. The proposed location of OSPZ-1 (approximately 20 feet to the east of OSMW-8S/D) is illustrated on **Figure 3**. The piezometer will be installed approximately one week before the installation of OSMW-8S/D and will be constructed of slotted five-foot long and 1-inch diameter PVC well screen and riser. The base of the piezometer will be placed at a depth of approximately nine feet below ground surface which is approximately three feet above the depth where saturated soil conditions were observed during the completion of OSGP-2. The presence/absence of groundwater within OSPZ-1 will be determined on a daily basis during the completion of the Potential Preferential Pathway Evaluation. OSPZ-1 will also be incorporated into the monthly depth to groundwater measurement program.

2.4. Groundwater Sampling

Initial groundwater samples will be collected a minimum of two weeks after well development. Groundwater samples will be collected with bladder pumps using the low flow methods described in SOP-GW-7 *Groundwater Sampling Using Low-Flow Revision 2.0*. Groundwater samples will be analyzed for 1,4 Dioxane according to SW-846 Method 8270D SIM. Groundwater analysis will be performed by SGS Accutest. QA/QC samples, including duplicates, equipment blanks, field blanks, matrix spike, matrix spike duplicates, and trip blanks will be collected in accordance with the amended QAPP (AMAI, 2016b; BMSMC, 2016). All laboratory data will be certified and validated by a chemist that is licensed in Puerto Rico to practice data validation services. Analytical data will be validated using applicable USEPA guidance and standard operating procedures.

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2.5. Storm Sewer Infiltration Assessment

A Storm Sewer Infiltration Assessment will be conducted to determine if groundwater is infiltrating the 52"x72" elliptic storm sewer to a meaningful degree. The Storm Sewer Infiltration Assessment will consist of visually inspecting one upgradient storm sewer manhole and two down gradient manholes for evidence of groundwater infiltration to the storm sewer during periods of dry weather conditions (typically defined as a minimum of three to five days without measurable rainfall). In addition, the outfall of the storm sewer into Frontera Creek will also be inspected for discharge into Frontera Creek during dry weather conditions.

Specific storm sewer manholes that will be inspected during the Storm Sewer Infiltration Assessment are shown on **Figure 3**. Manhole A is located approximately 600 feet upgradient of the BMSMC facility and will be used to evaluate if observable groundwater infiltration is occurring upgradient of the Facility. Note Manhole A is not shown of **Figure 3**. Manhole B is located adjacent to the Facility and approximately 1,300 feet east of Manhole A. Manhole B will be used to evaluate if groundwater emanating from the western half of the Facility is infiltrating the storm sewer. The third manhole (MH-410N) is located approximately 1,260 feet east of Manhole B and downgradient of the southeastern corner of the Facility. MH-410N is located near the storm sewer outfall at Frontera Creek and will be used to evaluate if groundwater from the eastern half of the Facility is infiltrating the storm sewer. The location of the storm sewer outfall to Frontera Creek is also illustrated on **Figure 3**.

The manhole inspections will consist of identifying direct evidence of groundwater infiltration (e.g. flow within the storm sewer and/or active groundwater seepage into the manhole) or secondary evidence of groundwater infiltration (e.g. presence of wet-rings within the manhole). As noted above, the outfall of the storm sewer into Frontera Creek will also be inspected for discharge into Frontera Creek during dry weather conditions. Three rounds of manhole and outfall inspections will be completed during three separate periods of dry weather to verify that observations made during any given round are not anomalous.

If meaningful groundwater infiltration is observed, then BMSMC will attempt to estimate the upgradient and downgradient contributions of groundwater infiltration into the storm sewer. At each manhole where groundwater infiltration is observed, the depth of water within the manhole will be determined using a slotted PVC pipe and water level meter and the average flow velocity (feet/second) will be determined using a portable flow meter. Cross-sectional flow at each manhole location will be calculated using the depth of water within the storm sewer, flow velocity, and sewer pipe geometry.[7] A comparison of the cross-sectional flow at the upgradient manhole location to the downgradient manhole locations will be used to qualitatively estimate the contribution of groundwater infiltrating into the storm sewer between the manholes.

2.6. Sample Location Survey

All test pit excavation, monitoring well, and piezometer locations will be surveyed after the completion of the field investigation activities. Each sample location will be incorporated into the facility base map. Easting and northing coordinates based on the Puerto Rico state plane coordinate system, surface elevation, and top of casing elevation (monitoring wells only) will be entered into the project database.

2.7. Management of Investigation Derived Waste

Investigation derived waste (IDW) includes excess soil from test pit excavations, soil cuttings, decontamination fluids, groundwater from well purging, excess sampling material, and contaminated personal protective equipment (PPE). As noted in Section 2.2.2, demolition debris, including broken asphalt and road bed material, will be managed onsite in a roll-off container.

Soil IDW will be managed and disposed in accordance with BMSMC's Soil Management Plan (SMP). The SMP requires collection of soil and other solid IDW in dedicated United States Department of Transportation (USDOT) approved steel drums. Each DOT-approved steel drum will be labeled and temporarily stored in the facility's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Drum Storage Area. BMSMC will manage, transport, and dispose of the drums as a RCRA hazardous waste. The soil drums will be managed and transported in compliance with the United State Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) regulations. To comply with both APHIS and RCRA regulations, potentially-hazardous soil must be destroyed by incineration in a RCRA permitted hazardous waste disposal facility. Liquid IDW will be also be managed and disposed as a hazardous waste. Liquid IDW will be collected in the facility's RCRA Hazardous Waste Storage Tank, T-901. BMSMC will dispose the contents of T-901 as a hazardous waste at an off-site RCRA permitted hazardous waste disposal facility in accordance with BMSMC's RCRA Hazardous Waste Management Permit.

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[7] If water is discharging from the storm sewer to Frontera Creek during dry weather periods, then the approximate discharge flow rate at the outfall to Frontera Creek will also be estimated.

2.8. Groundwater Data Analysis

Comparison

1,4-Dioxane concentrations in groundwater collected within the bedding of the sanitary and storm sewers will be compared to 1,4-Dioxane concentrations in groundwater downgradient of the Facility and concentrations in downgradient offsite monitoring wells to determine if the storm and/or sanitary sewer are acting as potential preferential pathways for contaminant transport in groundwater. Specifically, 1,4-Dioxane concentrations in groundwater samples collected within the bedding of the storm sewer (SEWTP-1 and SEWTP-2) and sanitary sewer (SEWTP-3) will be compared to groundwater samples collected from monitoring wells located along the downgradient southern perimeter of the Facility (MW-20S/D, S-35S/D, S-42S/D, and S-43S/D) and monitoring wells located south of the storm and sanitary sewers (OSMW-1S/D, OSMW-7S/D, OSMW-8S/D, OSMW-9S/D, OSMW-10S/10D, OSMW-11S/D and OSMW-12S/D).

If the 1,4-Dioxane concentrations in the sewer bedding material is similar to the 1,4-Dioxane concentrations in groundwater at the downgradient southern perimeter of the Facility and significantly greater than the 1,4-Dioxane concentrations in offsite groundwater monitoring wells, then it is likely the sewer bedding material is acting as a potential preferential pathway for contaminant transport in groundwater.

3.0 Implementation and Reporting Schedule

The field work for the Potential Preferential Pathway Evaluation will be implemented during March - April 2017. With the exception of the storm sewer infiltration assessment, the field work is expected to take approximately three weeks to complete. The Storm Sewer Infiltration Assessment is anticipated to be completed over a one- to two- month period.

Timing

A Technical Memorandum summarizing the scope and results of the Potential Preferential Pathway Evaluation will be prepared at the conclusion of the field work. The memorandum will be submitted to USEPA within 45 days of completion of the field work and receipt of final laboratory data packages. The Technical Memorandum will include a summary of work completed, test pit logs, soil boring and monitoring well construction logs, tabulation of analytical data, discussion of the results including a comparison of results to appropriate USEPA groundwater screening levels or PREQB Water Quality Standards, results of the storm sewer infiltration assessment, summary and recommendations, laboratory technical reports, and data validation reports.

4.0 References

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AMAI. (2016c). Release Assessment Phase 2A Technical Memorandum: Offsite Groundwater – South of Facility, Bristol-Myers Squibb Manufacturing Co., Huamcao, Puerto Rico. Purchase, NY: Anderson Mulholland & Associates, Inc.

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Figures